What is claimed is:

1. A disinfection reactor for disinfecting a liquid by exposing the liquid to ultraviolet light, said reactor comprising:

a. a reactor vessel defining an enclosure, the reactor vessel including a flow channel and a liquid inlet for receiving liquid to be treated and a liquid outlet through which treated liquid passes;

b. at least two spaced, tubular ultraviolet lamps positioned between the liquid inlet and the liquid outlet and having their respective longitudinal axes positioned substantially transversely relative to the direction of liquid flow through the flow channel;

c. a plurality of liquid guide surfaces positioned within the reactor vessel for guiding liquid to flow over the at least two ultraviolet lamps for exposure of the liquid to ultraviolet light, wherein the guide surfaces define at least one converging flow section upstream of the ultraviolet lamps, and wherein liquid flowing through the reactor vessel traverses a converging, turbulent flow pathway providing a reduced cross-sectional area flow pathway adjacent to the ultraviolet lamps for enhancing disinfection efficiency.

2. A disinfection reactor in accordance with claim 1, wherein the liquid guide surfaces are defined by a pair of opposed surfaces carried within the reactor vessel, the opposed surfaces spaced from each other to define a flow channel therebetween that is in communication with the liquid inlet and the liquid outlet, wherein the flow channel includes a reduced-area throat section.

3. A disinfection reactor in accordance with claim 2, wherein at least one of the lamps is disposed upstream of the reduced-area throat section and at least one of the lamps is disposed downstream of the reduced-area throat section so that liquid flowing through the flow channel passes over and around each of the ultraviolet lamps to disinfect liquid flowing through the flow channel.

4. A disinfection reactor in accordance with claim 3, wherein the at least two lamps have respective longitudinal axes that extend substantially perpendicularly to the direction of liquid flow through the reactor vessel.

5. A disinfection reactor in accordance with claim 2, wherein the reactor vessel includes at least three tubular ultraviolet lamps, one of which is positioned at the reduced-area throat section.

6. A disinfection reactor in accordance with claim 2, wherein the flow channel has a rectangular cross section between the opposed liquid guide surfaces.

7. A disinfection reactor in accordance with claim 2, wherein the opposed liquid guide surfaces are convexly curved.

8. A disinfection reactor in accordance with claim 2, wherein the flow channel has a substantially rectangular cross section.

9. A disinfection reactor in accordance with claim 2, including an inlet flow baffle member positioned upstream of the reduced-area throat section.

10. A disinfection reactor in accordance with claim 9, wherein the inlet flow baffle member includes a plurality of apertures that extend through the flow baffle member for substantially uniformly distributing the liquid to be treated across the flow channel.

11. A disinfection reactor in accordance with claim 2, wherein the opposed liquid guide surfaces each have a surface reflectance of at least about 80% on opposed faces thereof that define the flow channel.

12. A disinfection reactor in accordance with claim 11, wherein opposed faces of each of the liquid guide surfaces include an overlying reflector member for reflecting into the flow channel at least a substantial portion of the ultraviolet light that impinges on the opposed faces.

13. A disinfection reactor in accordance with claim 12, wherein the reflector members are polished aluminum sheets.

14. A disinfection reactor in accordance with claim 13, wherein the polished aluminum sheets are removably fastened to the liquid guide surfaces.

15. A disinfection reactor in accordance with claim 1, wherein the liquid guide surfaces each include at least one flow deflector vane for deflecting flowing liquid into the interior of the flow channel.

16. A disinfection reactor in accordance with claim 15, wherein the flow deflector vanes extend transversely across substantially the entire flow channel.

17. A disinfection reactor in accordance with claim 16, wherein the flow deflector vanes are carried by reflector members that overlie opposed faces of the liquid guide surfaces.

18. A disinfection reactor in accordance with claim 12, wherein the reflector members include an overlying clear polymeric protective coating.

19. A disinfection reactor in accordance with claim 12, wherein the reactor vessel includes an access cover for allowing access to the reflector members.

20. A disinfection reactor in accordance with claim 1 wherein the ultraviolet lamps are medium pressure lamps.

21. A disinfection reactor in accordance with claim 1 including a chemical oxidation agent injection system positioned adjacent the reactor inlet for injecting a chemical oxidant into liquid that enters the reactor vessel.

22. A disinfection reactor in accordance with claim 21, wherein the chemical oxidation agent injection system includes a source of hydrogen peroxide for injection into the liquid for additional disinfection and for additional oxidation of contaminants contained in the liquid.

23. A disinfection reactor in accordance with claim 21, wherein the chemical oxidation injection system includes a perforated distributor member for distributing a chemical oxidant across the flow direction of the liquid to be treated in the reactor vessel.

24. A disinfection reactor in accordance with claim 23, including an inlet flow baffle member positioned upstream of the reactor vessel reduced-area throat section, wherein the distributor member is disposed between the baffle member and the reduced-area throat section.

25. A disinfection reactor in accordance with claim 21, wherein the chemical oxidation agent injection system includes means for injecting into the flow stream a cleaning solution for cleaning surfaces through which ultraviolet light is emitted into the flow channel.

26. A disinfection reactor in accordance with claim 1, including an actinometric sampling system for monitoring ultraviolet light intensity in the flow channel within the reactor vessel.

27. A disinfection reactor in accordance with claim 26, wherein the actinometric sampling system provides an output signal representative of the intensity of ultraviolet light emitted into the liquid within the flow channel, and a variable power level control for increasing electrical power supplied to the ultraviolet lamps in response to the output signal from the actinometric sampling system.

28. A disinfection reactor in accordance with claim 1, including a liquid flow rate measuring device for providing a flow rate signal, and a motor-operated flow control valve positioned within the liquid flow path for controlling the liquid flow rate to a desired flow rate in response to the flow rate signal.

29. A disinfection reactor in accordance with claim 28, wherein the flow rate measuring device includes a first pressure tap at the reduced-area throat section of the flow channel for sensing throat section static pressure, and a second pressure tap spaced from the throat section for sensing a second static pressure to provide a differential pressure to enable determination of the liquid flow rate.

30. A disinfection reactor in accordance with claim 1, wherein the ultraviolet lamps are carried within respective tubular quartz sleeves that are supported at opposed sidewalls of the reactor vessel.

31. A disinfection reactor in accordance with claim 30, including sealing means for sealing the ultraviolet lamps from contact with liquid that flows within the flow channel.